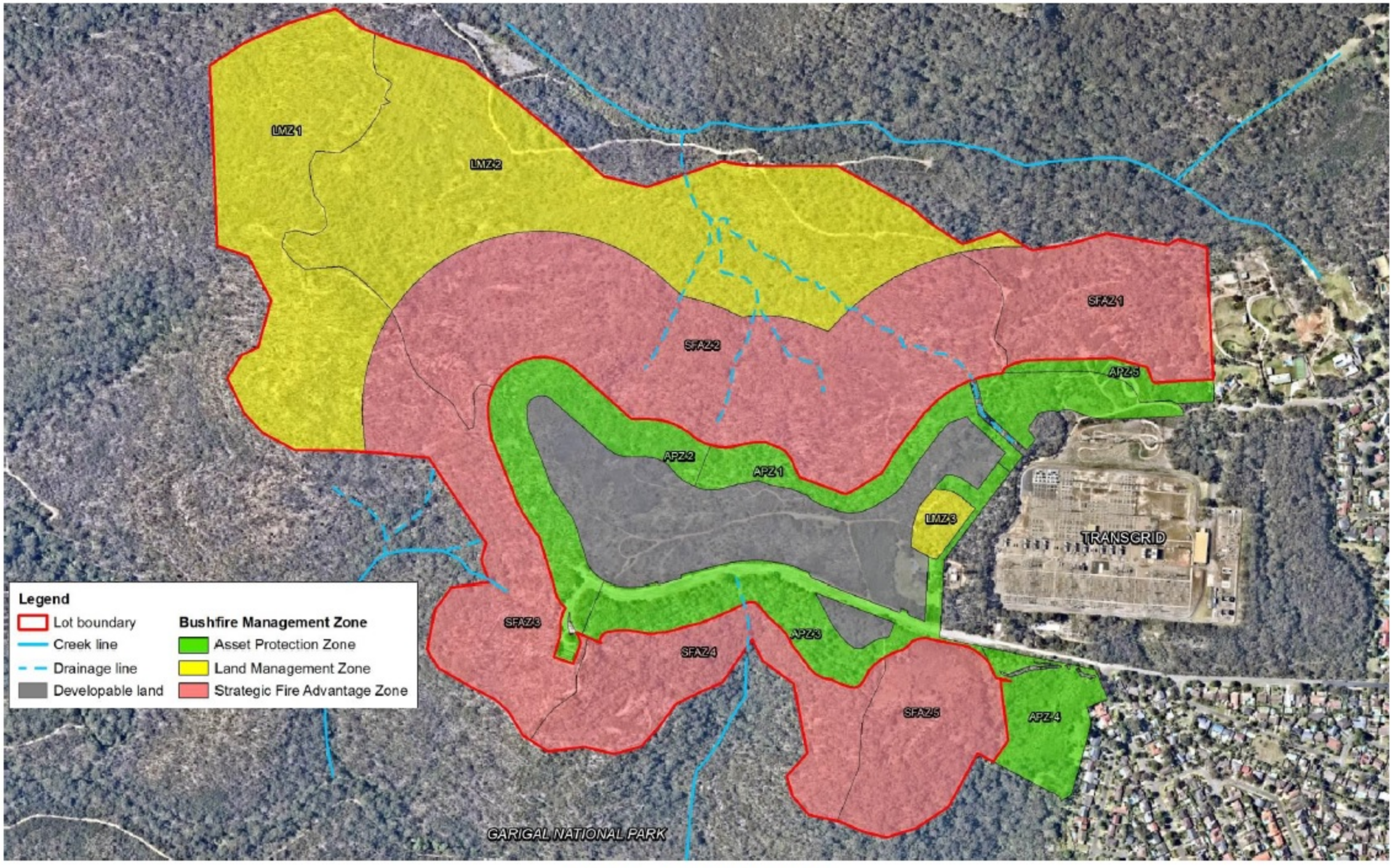
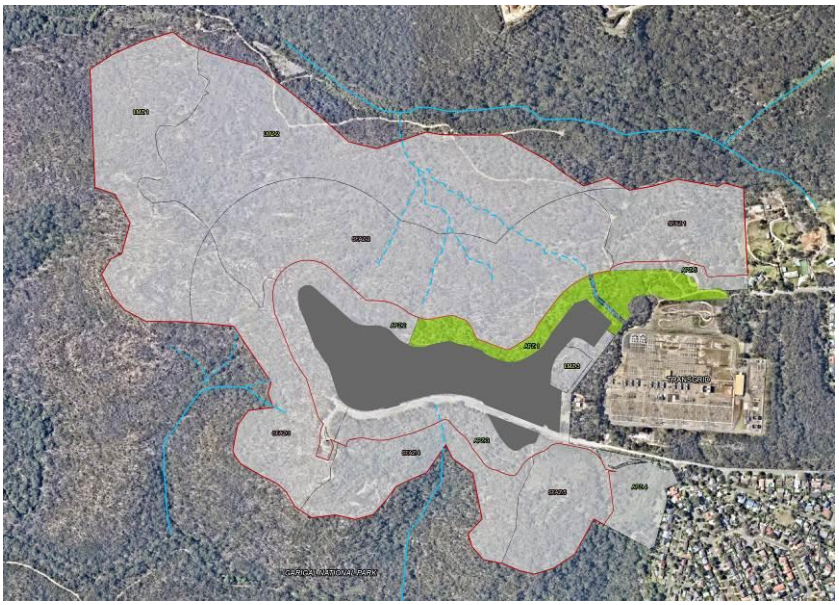


Figure 7 – Management zones

Asset Protection Zone 1 – (APZ 1)

(*The green colour highlights the location of the zone)*



BACKGROUND

Area = 4.45 ha

Dominant vegetation community	Vegetation formation	Area
Coastal Upland Swamp	Freshwater wetland	0.003ha
Low Open Forest (to 10m tall)	Dry Sclerophyll Forest	1.68ha
Open Forest (10m tall)		1.27ha
Short Heath (to 2.5m tall)	Heathland	0.44ha
Tall Heath (2.5 – 5m tall)		0.85ha
Cleared, Managed, Landscaped or Weed Plume	N/A	0.18ha

Threatened Species (Recorded) – Red-crowned Toadlet (*Pseudophryne australis),* Rosenberg's Goanna (*Varanus rosenbergi),* Eastern Pygmy Possum (*Cercartetus nanus,* Grey-headed Flying-fox (*Pteropus poliocephalus),* Eastern Bentwing-bat (*Miniopterus orianae oceansis),* Little Bentwing-bat (*Miniopterus australis).*

Potential Threatened Species (Foraging) – Little Eagle (*Hieraaetus morphnoides),*Glossy Black-Cockatoo (*Calyptorhynchus lathami*), Gang-gang Cockatoo (*Callocephalon fimbriatum),* Little Lorikeet (*Glossopsitta pusilla*), Barking Owl (*Ninox connivens),* Powerful Owl (*Ninox strenua*), Masked Owl (*Tyto novaehollandiae*), Varied Sitella (*Daphoenositta chrysoptera),* Scarlet Robin (*Petroica boodang),* Yellow-bellied Sheathtail-bat (*Saccolaimus flaviventris),*East-coast Freetail-bat (*Micronomus norfolkensis*)

Sites of Significance:
Ecologically significant trees, Nest and/or notably suitable tree sites (Eastern Pygmy Possum), Possible burrow and identified critical habitat (Rosenberg's Goanna) and breeding habitat (Red-crowned Toadlet).

OBJECTIVES

- to protect residents, visitors, dwellings and infrastructure from fires developing within the subdivision land including the retained vegetation within the nest and roost tree sites
- to retain important natural and cultural features within and adjoining the area as per Figure 6.

STRATEGIES

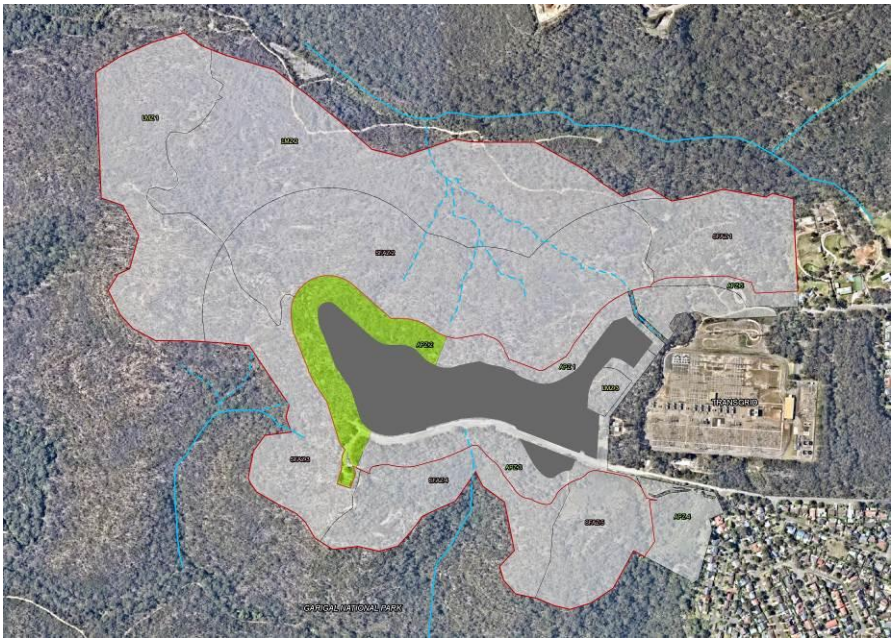
- to manage the environment in general accord with Table 8 and the ecological elements raised in Table 3.

- APZ to be managed in accord with RFS APZ standards
- management works by mowing, slashing and brush-cutter technique
- trees may remain whilst shrubs and other vegetation in the immediate vicinity of that vegetation should be retained thus leaving the opportunity for mowing tracks between trees
- maintenance of the fuel loads to occur to achieve desired fuel loads (i.e. 4t/ha) within the green asset protection zone
- in the period prior to residential development the APZ should be mowed regularly, retention of vegetation may occur in this area but subject to distances from assets as specified by *PBP 2006*.

ACTIONS

- undertake fuel reduction works on a regular basis of at least quarterly and as per varying climatic seasons which may cause fuel to grow
- annually review fuel loads prior to the bushfire season; document accurate details of maintenance works within this precinct. Documentation should include the date and extent of the maintenance.

Asset Protection Zone 2 – (APZ 2)



BACKGROUND

Area = 4.75 ha

Dominant vegetation community	Vegetation formation	Area (ha)
Low Open Forest (to 10m tall)	Dry Sclerophyll Forest	2.79
Open Forest (10m tall)		0.33
Short Heath (to 2.5m tall)	Heathland	0.05
Tall Heath (2.5 – 5m tall)		1.14v
Damp Tall Heath		0.005
Cleared, Managed, Landscaped or Weed Plume	N/A	0.43

Threatened Species- Rosenberg's Goanna (*Varanus rosenbergi*), Grey-headed Flying-fox (*Pteropus poliocephalus),* Eastern Pygmy Possum (*Cercartetus nanus),* Eastern Bentwing-bat (*Miniopterus orianae oceansis) &* Little Bentwing-bat (*Miniopterus australis).*

Potential Threatened Species (Foraging) – Little Eagle (*Hieraaetus morphnoides),* Glossy Black-Cockatoo (*Calyptorhynchus lathami*), Gang-gang Cockatoo (*Callocephalon fimbriatum),* Little Lorikeet (*Glossopsitta pusilla*), Barking Owl (*Ninox connivens),* Powerful Owl (*Ninox strenua*), Masked Owl (*Tyto novaehollandiae*), Varied Sitella (*Daphoenositta chrysoptera),* Scarlet Robin (*Petroica boodang),* Yellow-bellied Sheathtail-bat (*Saccolaimus flaviventris)&* East-coast Freetail-bat (*Micronomus norfolkensis*)

Sites of Significance – Ecologically significant trees, Nest and/or notably suitable tree sites (Eastern Pygmy Possum), Possible burrow and identified critical habitat (Rosenberg's Goanna) and nearby breeding habitat (Red-crowned Toadlet)

OBJECTIVES

- to protect residents, visitors, dwellings and infrastructure from fires developing within the subdivision land including the retained vegetation within the nest and roost tree sites
- to retain important natural and cultural features within and adjoining the area as per Figure 6.

STRATEGIES

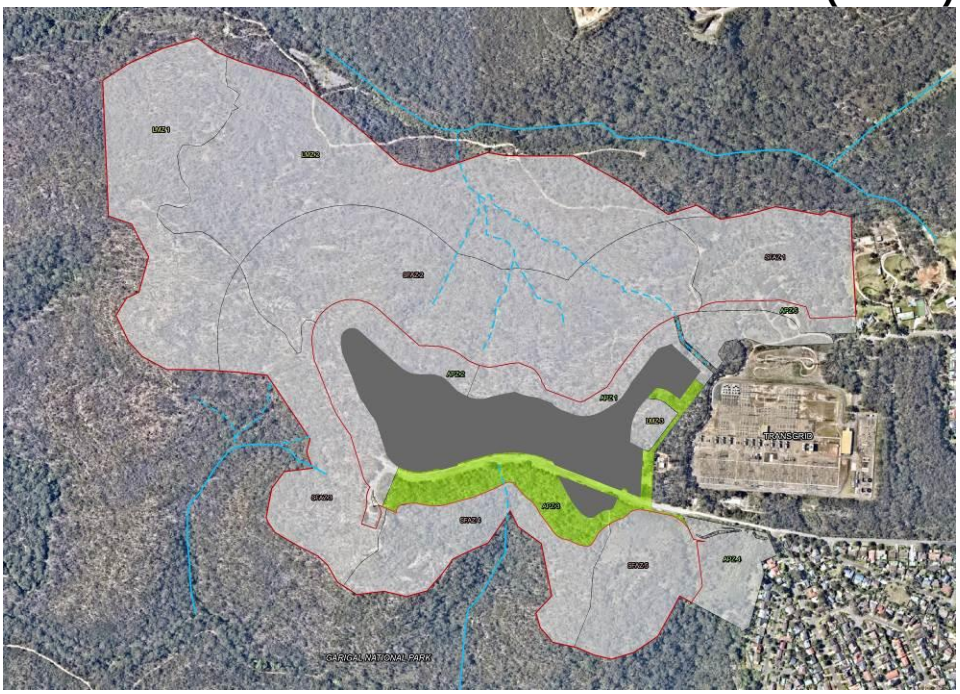
- to manage the environment in general accord with Table 8 and the ecological elements raised in Table 3.
- APZ to be managed in accord with RFS APZ standards
- management works by mowing, slashing and brush-cutter technique
- in the period prior to residential development the APZ should be mowed regularly. Retention of vegetation may occur in this area but subject to distances from assets as specified by *PBP 2006*.

- trees may remain whilst shrubs and other vegetation in the immediate vicinity of that vegetation should be retained thus leaving the opportunity for mowing tracks between trees
- maintenance of the fuel loads to occur to achieve desired fuel loads (i.e. 4t/ha) within the green asset protection zone.

ACTIONS

- undertake fuel reduction works on a regular basis of at least quarterly and as per varying climatic seasons which may cause fuel to grow
- annually review fuel loads prior to the bushfire season; document accurate details of maintenance works within this precinct. Documentation should include the date and extent of the maintenance.

Asset Protection Zone 3 – (APZ 3)



BACKGROUND

Area = 5.12 ha

Dominant vegetation community	Vegetation formation	Area (ha)
Coastal Upland Swamp	Freshwater wetland	0.21
Low Open Forest (to 10m tall)	Dry sclerophyll Forest	1.34
Open Forest (10+m tall)		0.44
Sandstone Gully Forest		0.35
Tall Heath (2.5 - 5m tall)	Heathland	1.45
Cleared, Managed, Landscaped or Weed Plume	N/A	1.33

Threatened Species (Recorded) – Red-crowned Toadlet (*Pseudophryne australis),* Rosenberg's Goanna (*Varanus rosenbergi),* Grey-headed Flying-fox (*Pteropus poliocephalus),* Eastern Bentwing-bat (*Miniopterus orianae oceansis),* Little Bentwing-bat (*Miniopterus australis).*

Potential Threatened Species (Foraging) – Eastern Pygmy Possum (*Cercartetus nanus),* Little Eagle (*Hieraaetus morphnoides),* Glossy Black-Cockatoo (*Calyptorhynchus lathami*), Gang-gang Cockatoo (*Callocephalon fimbriatum),* Little Lorikeet (*Glossopsitta pusilla*), Barking Owl (*Ninox connivens),* Powerful Owl (*Ninox strenua*), Masked Owl (*Tyto novaehollandiae*), Varied Sitella (*Daphoenositta chrysoptera),* Scarlet Robin (*Petroica boodang),* Yellow-bellied Sheathtail-bat (*Saccolaimus flaviventris)* East-coast Freetail-bat (*Micronomus norfolkensis*)

- Sites of Significance – Ecologically significant trees, Possible burrows (Rosenberg's Goanna), Adjacent breeding habitat (Red-crowned Toadlet)

OBJECTIVES

- to protect residents, visitors, dwellings and infrastructure from fires developing within the subdivision land including the retained vegetation within the nest and roost tree sites
- to retain important natural and cultural features within and adjoining the area as per Figure 6.

STRATEGIES

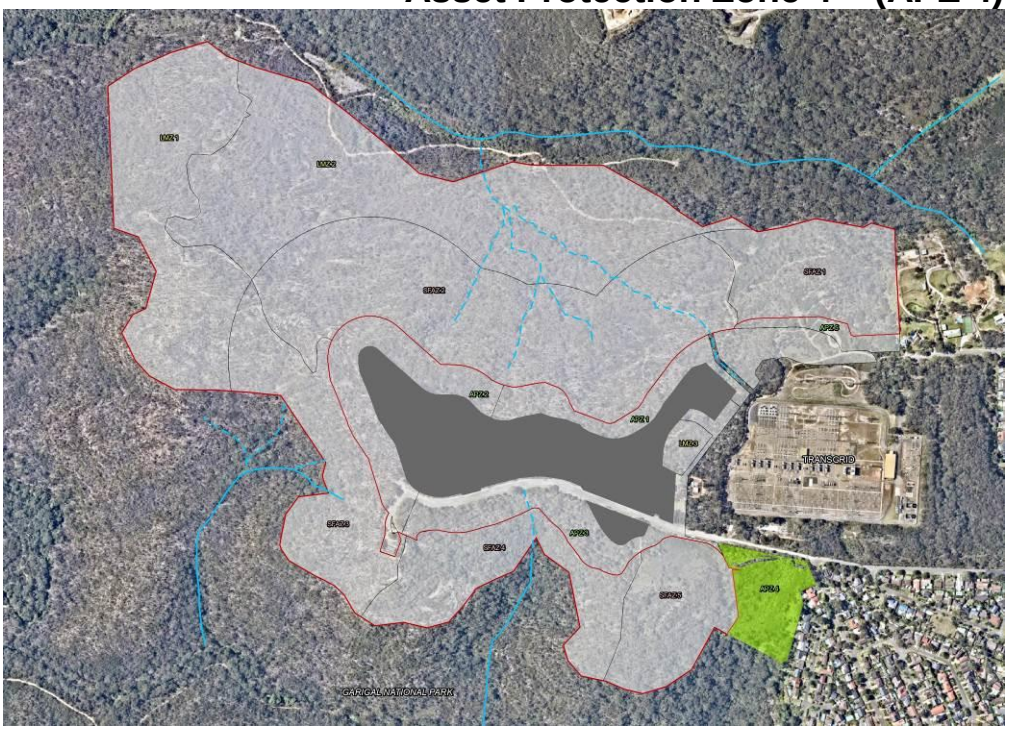
- to manage the environment in general accord with Table 8 and the ecological elements raised in Table 3
- APZ to be managed in accord with RFS APZ Standards
- management works by mowing, slashing and brush-cutter technique
- in the period prior to residential development the APZ should be mowed regularly, retention of vegetation may occur in this area but subject to distances from assets as specified by *PBP 2006*.

- trees may remain whilst shrubs and other vegetation in the immediate vicinity of that vegetation should be retained thus leaving the opportunity for mowing tracks between trees
- maintenance of the fuel loads to occur to achieve desired fuel loads (i.e. 4t/ha) within the green asset protection zone.

ACTIONS

- undertake fuel reduction works on a regular basis of at least quarterly and as per varying climatic seasons which may cause fuel to grow
- annually review fuel loads prior to the bushfire season; document accurate details of maintenance works within this precinct. Documentation should include the date and extent of the maintenance.

Asset Protection Zone 4 – (APZ 4)



BACKGROUND

Area = 2.73 ha

Dominant vegetation community	Vegetation Formation	Area (ha)
Coastal Upland Swamp	Freshwater wetland	0.30
Damp Tall Heath	Heathland	0.65
Open Forest (10+m tall)	Dry sclerophyll Forest	1.24
Cleared, Managed, Landscaped or Weed Plume	N/A	0.54

OBJECTIVES

- to recognise Transgrid operational rights and needs.
- to protect residents on east boundary near Elm Road.
- to deny intense fire from creating a fire pinch point on Ralstson Avenue.
- to retain important natural and cultural features.

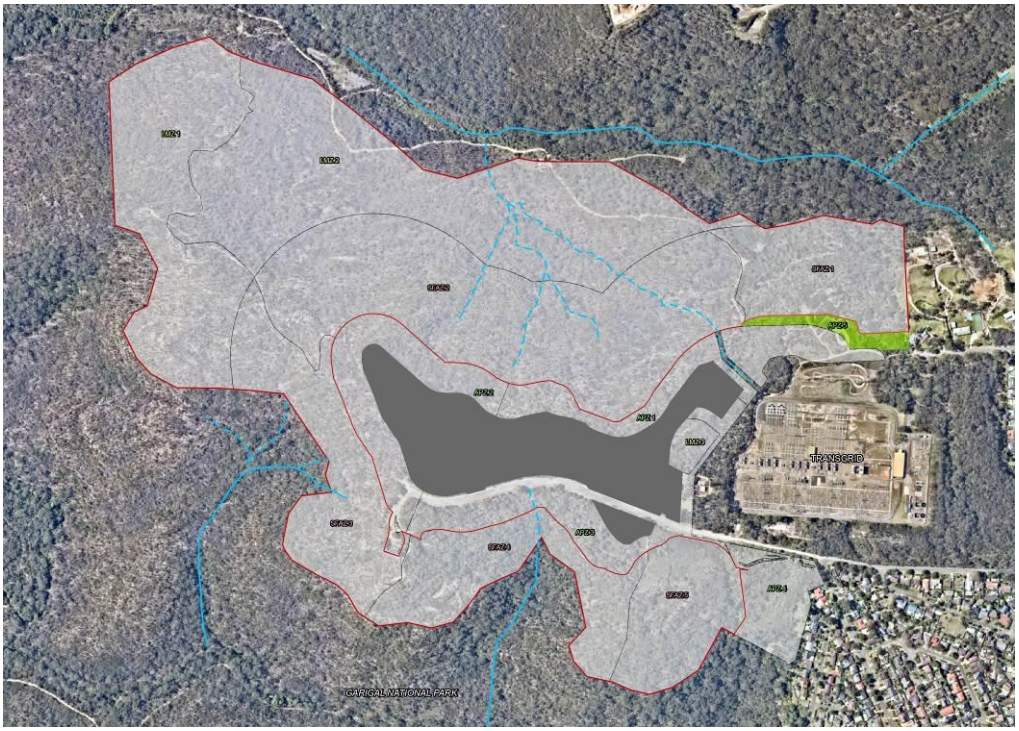
STRATEGIES

- retain and protect Coastal Upland Swamp with a 15m vegetated buffer.
- management of APZ works by mowing, slashing and brush-cutter technique
- in the period prior to residential development the APZ should be mowed regularly, retention of vegetation may occur in this area but subject to distances from assets as specified by *PBP 2006*.
- trees may remain whilst shrubs and other vegetation in the immediate vicinity of that vegetation should be retained thus leaving the opportunity for mowing tracks between trees
- maintenance of the fuel loads to occur to achieve desired fuel loads (i.e. 4t/ha) within the green asset protection zone.

ACTIONS

- undertake fuel reduction works on a regular basis of at least quarterly and as per varying climatic seasons which may cause fuel to grow
- annually review fuel loads prior to the bushfire season; document accurate details of maintenance works within this precinct. Documentation should include the date and extent of the maintenance.

Asset Protection Zone 5 – (APZ 5)



BACKGROUND

Area = 0.92 ha

Dominant vegetation community	Vegetation Formation	Area (ha)
Low Open Forest (to 10m tall)	Dry sclerophyll Forest	0.06
Open Forest (10+m tall)		0.07
Short Heath (to 2.5m tall)	Heathland	0.14
Tall Heath (2.5 - 5m tall)		0.54
Cleared, Managed, Landscaped or Weed Plume	N/A	0.11

OBJECTIVES

- to recognise Transgrid operational rights and needs.
- to reduce impact upon habitat for Rosenberg Goanna.
- to protect residents on east boundary near Wyatt Avenue.
- to deny intense fire from creating a fire pinch point Wyatt Avenue road reserve

STRATEGIES

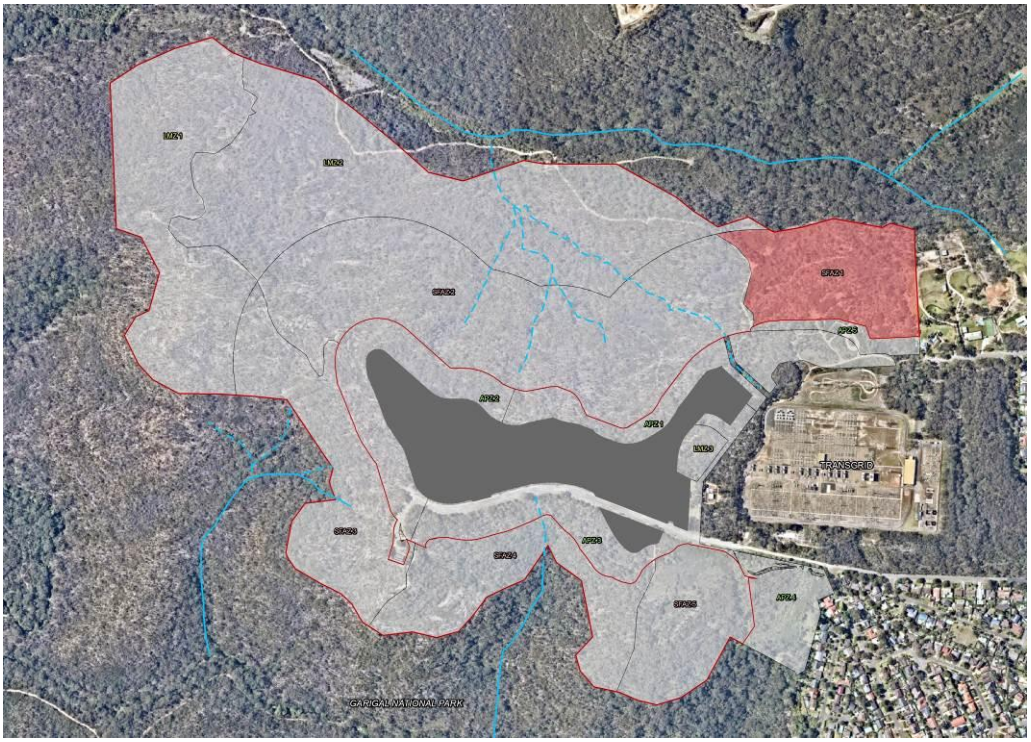
- management works by mowing, slashing and brush-cutter technique
- maintenance of the fuel loads to occur to achieve desired fuel loads (i.e. 4t/ha) within the green asset protection zone.

ACTIONS

- undertake fuel reduction works on a regular basis of at least quarterly and as per varying climatic seasons which may cause fuel to grow
- annually review fuel loads prior to the bushfire season; document accurate details of maintenance works within this precinct. Documentation should include the date and extent of the maintenance.

Strategic Fire Advantage Zone 1 - (SFAZ 1)

(*The pink colour highlights the location of the zone)*



BACKGROUND

Area =6.66 ha

Dominant vegetation community	Vegetation Formation	Area (ha)
Low Open Forest (to 10m tall)	Dry sclerophyll Forest	2.11
Open Forest (10+m tall)		0.58
Sandstone Gully Forest		0.26
Short Heath (to 2.5m tall)	Heathland	0.77
Tall Heath (2.5 - 5m tall)		2.43
Cleared, Managed, Landscaped or Weed Plume	N/A	0.51

Threatened Species – Red-crowned Toadlet (*Pseudophryne australis),* Rosenberg's Goanna (*Varanus rosenbergi),* Eastern Bentwing-bat (*Miniopterus orianae oceansis) &* Little Bentwing-bat (*Miniopterus australis)*

Potential Threatened Species (Foraging) – Eastern Pygmy Possum (*Cercartetus nanus),* Little Eagle (*Hieraaetus morphnoides),* Glossy Black-Cockatoo (*Calyptorhynchus lathami*), ,Gang-gang Cockatoo, (*Callocephalon fimbriatum),* Little Lorikeet (*Glossopsitta pusilla*), Barking Owl (*Ninox connivens),* Powerful Owl (*Ninox strenua*), Masked Owl (*Tyto novaehollandiae*), Varied Sitella (*Daphoenositta chrysoptera),* Scarlet Robin (*Petroica boodang),* Grey-headed Flying-fox (*Pteropus poliocephalus),* Yellow-bellied Sheathtail-bat (*Saccolaimus flaviventris),* East-coast Freetail-bat (*Micronomus norfolkensis*)

Threatened Species Habitat – Apparent/recorded burrow (Rosenberg's Goanna), Termite Mound/Nest (Rosenberg's Goanna), Rosenberg's Goanna & Red-crowned Toadlet.

OBJECTIVES

- to manage the landscape for the ongoing sustainability of insitu ecological resources
- to retain important natural and cultural features within and adjoining the area.

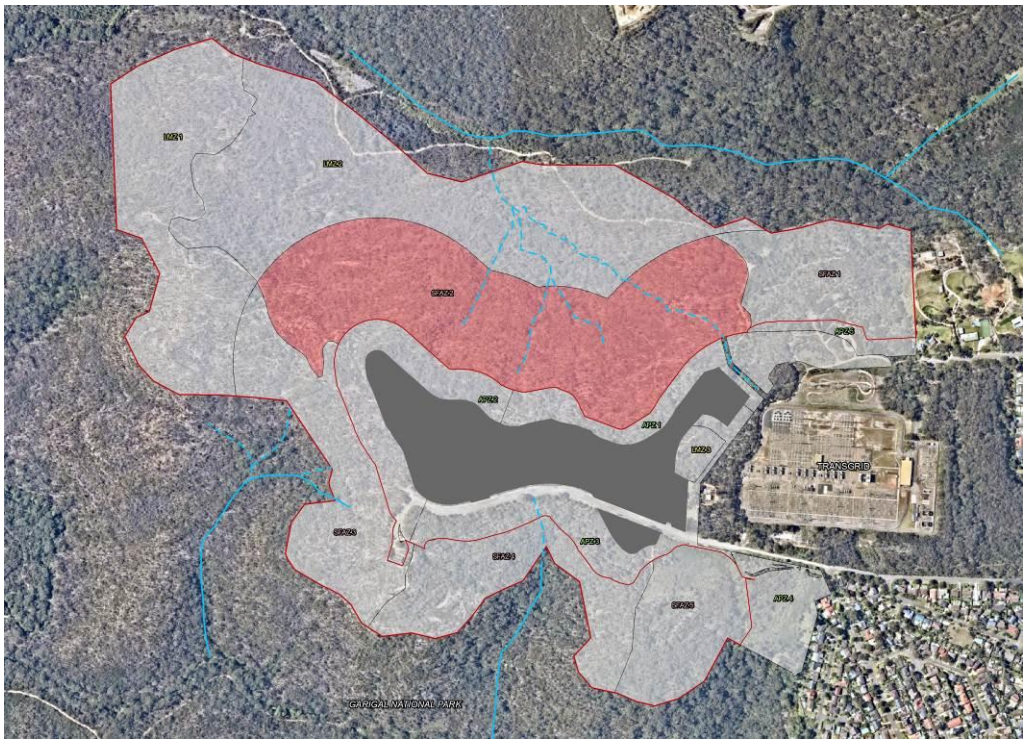
STRATEGIES

- to manage the environment in general accord with Table 9
- do not burn beyond the natural burn regime
- manage fire trails in accord with contemporary standards.

ACTIONS

- undertake prescribed burns as per Table 4a
- monitor wildfire impacts and map and record all data.

Strategic Fire Advantage Zone 2 - (SFAZ 2)



BACKGROUND

Area = 21.53 ha

Dominant vegetation community	Vegetation Formation	Area (ha)
Damp Tall Heath	Heathland	0.41
Low Open Forest (to 10m tall)	Dry sclerophyll Forest	6.23
Open Forest (10+m tall)		10.76
Sandstone Gully Forest		0.86
Short Heath (to 2.5m tall)	Heathland	1.31
Tall Heath (2.5 - 5m tall)		1.81
Cleared, Managed, Landscaped or Weed Plume	N/A	0.15

Riparian & Stream Order – First Order Stream, 10m Riparian buffer + channel width and a drainage Line

Threatened Species – Red-crowned Toadlet (*Pseudophryne australis),* Giant Burrowing Frog (*Heleioporus australiacus*), ***Rosenberg's*** Goanna (*Varanus rosenbergi),* Eastern Pygmy Possum (*Cercartetus nanus)*

Potential Threatened Species (Foraging) – Little Eagle (*Hieraaetus morphnoides),* Glossy Black-Cockatoo (*Calyptorhynchus lathami),* Gang-gang Cockatoo (*Callocephalon fimbriatum),* Little Lorikeet (*Glossopsitta pusilla*), Barking Owl (*Ninox connivens),* Powerful Owl (*Ninox strenua*), Masked Owl (*Tyto novaehollandiae*), Varied Sitella (*Daphoenositta chrysoptera),* Scarlet Robin (*Petroica boodang),* Grey-headed Flying-fox (*Pteropus poliocephalus),* Yellow-bellied Sheathtail-bat (*Saccolaimus flaviventris),* Eastern Bentwing-bat (*Miniopterus orianae oceansis),* Little Bentwing-bat (*Miniopterus australis)* and East-coast Freetail-bat (*Micronomus norfolkensis*)

Threatened Species Habitat - Breeding habitat (Red-crowned Toadlet), Critical Habitat (Rosenberg's Goanna), Apparent/recorded burrow (Rosenberg's Goanna)

Endangered Ecological Communities (EEC)
Coastal Upland Damp Heath Swamp

OBJECTIVES

- to manage the landscape for the ongoing sustainability of insitu ecological resources
- to retain important natural and cultural features within and adjoining the area.

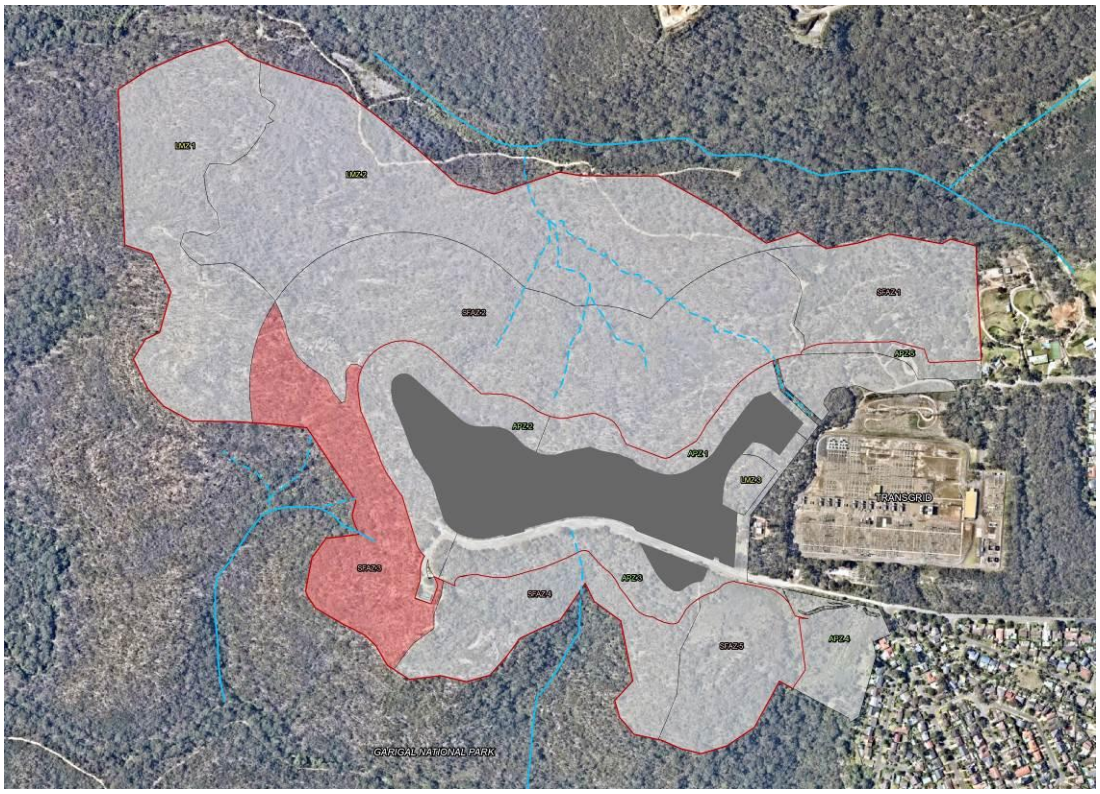
STRATEGIES

- to manage the environment in general accord with Table 9
- do not burn beyond the natural burn regime
- manage fire trails in accord with contemporary standards
- avoid identified threatened frog breeding locations

ACTIONS

- undertake prescribed burns as per Table 4a
- monitor wildfire impacts and map and record all data.

Strategic Fire Advantage Zone 3 - (SFAZ 3)



BACKGROUND

Area = 8.45 ha

Dominant vegetation community	Vegetation Formation	Area (ha)
Low Open Forest (to 10m tall)	Dry sclerophyll Forest	6.82
Open Forest (10+m tall)		0.13
Sandstone Gully Forest		1.23
Tall Heath (2.5 - 5m tall)	Heathland	0.14
Cleared, Managed, Landscaped or Weed Plume	N/A	0.13

Riparian & Stream Order – First Order Stream, \10m Riparian buffer + channel width (?)

Threatened Species – Red-crowned Toadlet (*Pseudophryne australis)*

Potential Threatened Species (Foraging) – Eastern Pygmy Possum (*Cercartetus nanus),* Little Eagle (*Hieraaetus morphnoides),* Glossy Black-Cockatoo (*Calyptorhynchus lathami*), Gang-gang Cockatoo (*Callocephalon fimbriatum),* Little Lorikeet (*Glossopsitta pusilla*), Barking Owl (*Ninox connivens),* Powerful Owl (*Ninox strenua*), Masked Owl (*Tyto novaehollandiae*), Varied Sitella (*Daphoenositta chrysoptera),* Scarlet Robin (*Petroica boodang),* Grey-headed Flying-fox (*Pteropus poliocephalus),* Yellow-bellied Sheathtail-bat (*Saccolaimus flaviventris),* Eastern Bentwing-bat (*Miniopterus orianae oceansis),* East-coast Freetail-bat (*Micronomus norfolkensis*), Rosenberg's Goanna (*Varanus rosenbergi*)

Threatened Species Habitat – Breeding habitat (Red-crowned Toadlet)

Endangered Ecological Communities (EEC)
Nil

OBJECTIVES

- to manage the landscape for the ongoing sustainability of insitu ecological resources

- to retain important natural and cultural features within and adjoining the area.

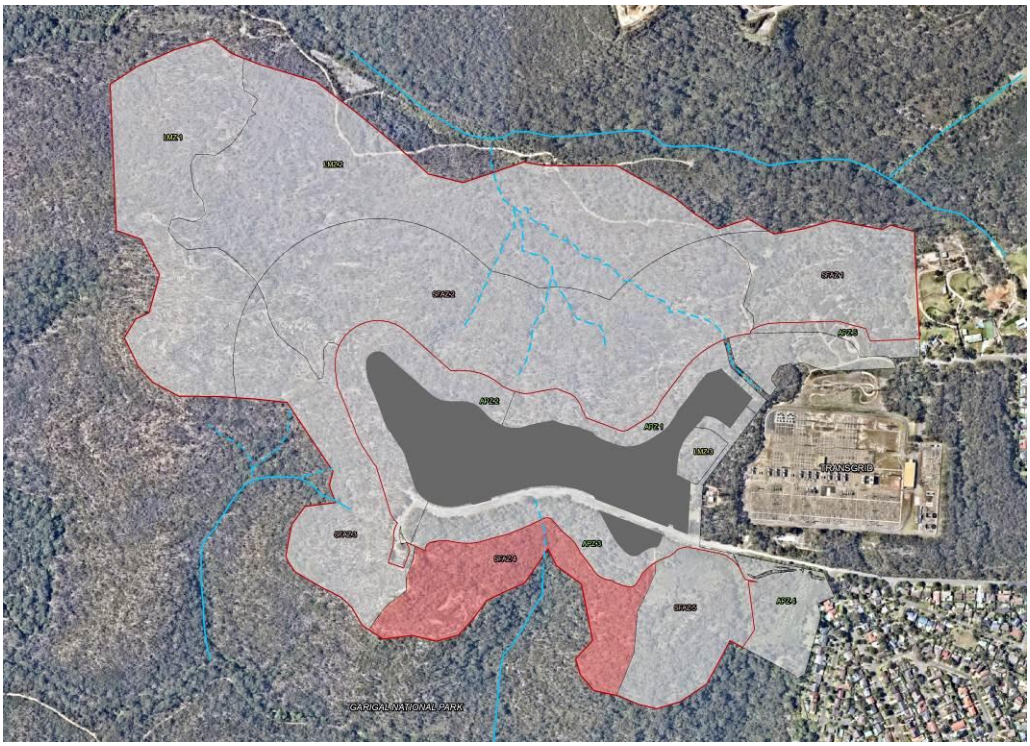
STRATEGIES

- to manage the environment in general accord with Table 9
- do not burn beyond the natural burn regime
- manage fire trails in accord with contemporary standards.

ACTIONS

- undertake prescribed burns as per Table 4a
- monitor wildfire impacts and map and record all data.

Strategic Fire Advantage Zone 4 - (SFAZ 4)



BACKGROUND

Area = 7.05ha

Dominant Vegetation community	Vegetation Formation	Area (ha)
Coastal Upland Swamp	Freshwater wetland	0.004
Low Open Forest (to 10m tall)	Dry sclerophyll Forest	1.61
Open Forest (10+m tall)		1.05
Sandstone Gully Forest		2.96
Tall Heath (2.5 - 5m tall)	Heathland	1.39
Cleared, Managed, Landscaped or Weed Plume	N/A	0.04

Riparian & Stream Order – Drainage Line

Threatened Species – Red-crowned Toadlet (*Pseudophryne australis) &* Rosenberg's Goanna (*Varanus rosenbergi)*

Potential Threatened Species (Foraging) – Eastern Pygmy Possum (*Cercartetus nanus),* Little Eagle (*Hieraaetus morphnoides),* Glossy Black-Cockatoo (*Calyptorhynchus lathami*), Gang-gang Cockatoo (*Callocephalon fimbriatum),* Little Lorikeet (*Glossopsitta pusilla*), Barking Owl (*Ninox connivens),* Powerful Owl (*Ninox strenua*), Masked Owl (*Tyto novaehollandiae*), Varied Sitella (*Daphoenositta chrysoptera),* Scarlet Robin (*Petroica boodang),* Grey-headed Flying-fox (*Pteropus poliocephalus),* Yellow-bellied Sheathtail-bat (*Saccolaimus flaviventris),* Eastern Bentwing-bat (*Miniopterus orianae oceansis),* Little Bentwing-bat (*Miniopterus australis),* East-coast Freetail-bat (*Micronomus norfolkensis*)

Threatened Species Habitat – Breeding habitat (Red-crowned Toadlet), Notably suitable trees (Eastern Pygmy Possum)

Endangered Ecological Communities (EEC)
Nil

OBJECTIVES

- to manage the landscape for the ongoing sustainability of insitu ecological resources

- to retain important natural and cultural features within and adjoining the area.

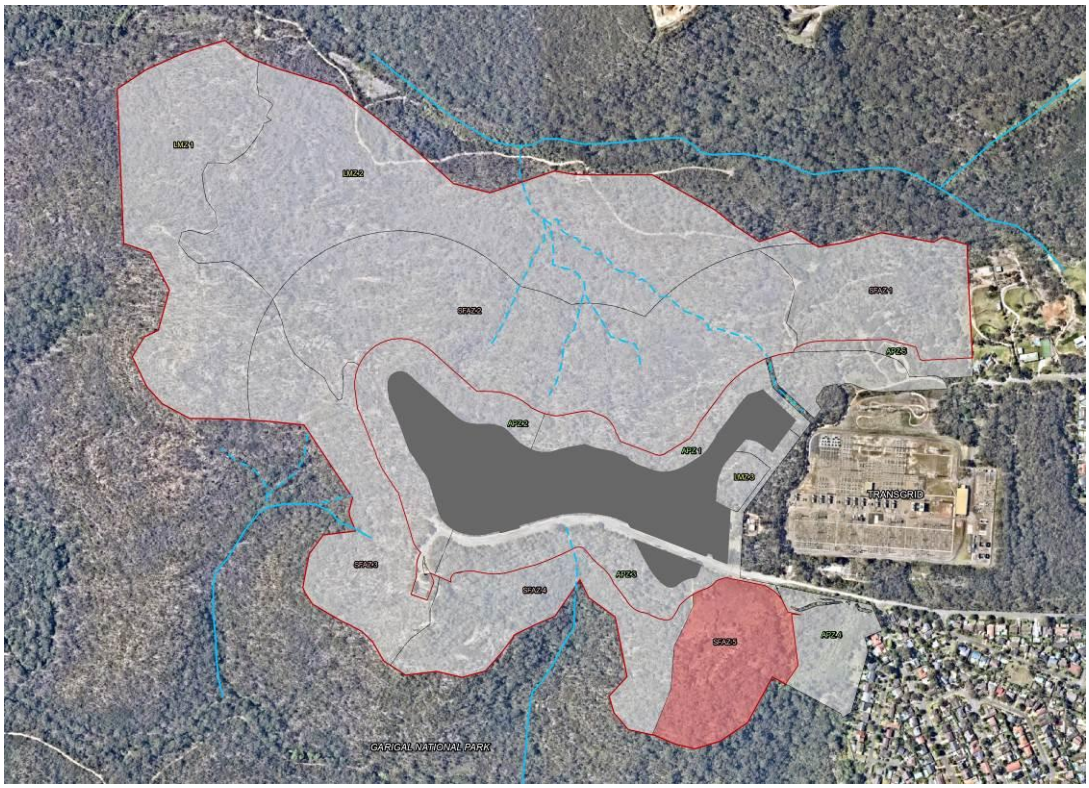
STRATEGIES

- to manage the environment in general accord with Table 9
- do not burn beyond the natural burn regime
- manage fire trails in accord with contemporary standards.

ACTIONS

- undertake prescribed burns as per Table 4a
- monitor wildfire impacts and map and record all data.

Strategic Fire Advantage Zone 5 - (SFAZ 5)



BACKGROUND

Area = 5.52 Ha

Vegetation community	Vegetation Formation	Area (ha)
Coastal Upland Swamp	Freshwater wetland	1.35
Low Open Forest (to 10m tall)	Dry sclerophyll Forest	1.24
Open Forest (10+m tall)		1.66
Sandstone Gully Forest		1.05
Tall Heath (2.5 - 5m tall)	Heathland	0.2
Cleared, Managed, Landscaped or Weed Plume	N/A	0.01

Riparian & Stream Order – Nil

Threatened Species – Red-crowned Toadlet (*Pseudophryne australis),* Eastern Bentwing-bat (*Miniopterus orianae oceansis),* Little Bentwing-bat (*Miniopterus australis)*

Potential Threatened Species (Foraging) – Eastern Pygmy Possum (*Cercartetus nanus),* Little Eagle (*Hieraaetus morphnoides),* Glossy Black-Cockatoo (*Calyptorhynchus lathami*), Gang-gang Cockatoo (*Callocephalon fimbriatum),* Little Lorikeet (*Glossopsitta pusilla*), Barking Owl (*Ninox connivens),* Powerful Owl (*Ninox strenua*), Masked Owl (*Tyto novaehollandiae*), Varied Sitella (*Daphoenositta chrysoptera),* Scarlet Robin (*Petroica boodang),* Grey-headed Flying-fox (*Pteropus poliocephalus),* Yellow-bellied Sheathtail-bat (*Saccolaimus flaviventris),* East-coast Freetail-bat (*Micronomus norfolkensis*).

Threatened Species Habitat
Breeding habitat (Red-crowned Toadlet)

Endangered Ecological Communities (EEC)
Coastal Upland Damp Heath Swamp

OBJECTIVES

- to manage the landscape for the ongoing sustainability of insitu ecological resources
- to retain important natural and cultural features within and adjoining the area.

STRATEGIES

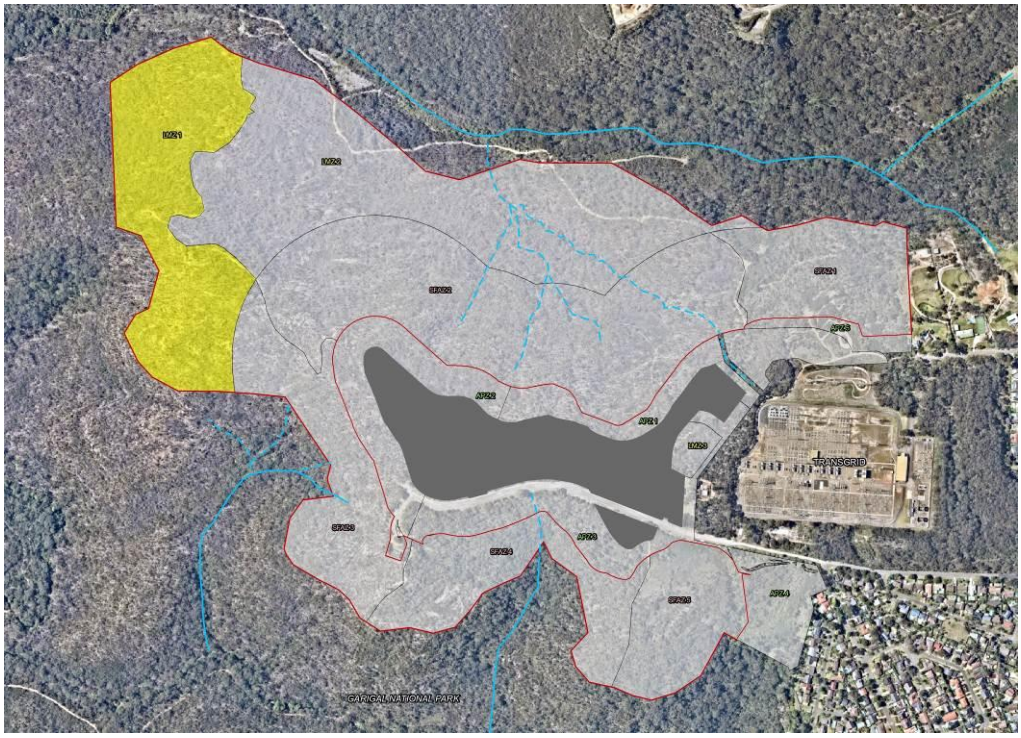
- to manage the environment in general accord with Table 9
- do not burn beyond the natural burn regime
- manage fire trails in accord with contemporary standards.

ACTIONS

- undertake prescribed burns as per Table 4a
- monitor wildfire impacts and map and record all data.

Land Management Zone 1 - (LMZ 1)

(*The yellow colour highlights the location of the zone)*



BACKGROUND

Area =- 12.88 ha

Dominant vegetation community	Vegetation Formation	Area (ha)
Low Open Forest (to 10m tall)	Dry Sclerophyll Forest	7.03
Open Forest (10+m tall)		4.76
Sandstone Gully Forest		0.66
Tall Heath (2.5 - 5m tall)	Heathland	0.32
Cleared, Managed, Landscaped or Weed Plume	N/A	0.11

Threatened Species – Red-crowned Toadlet (*Pseudophryne australis) &* Rosenberg's Goanna (*Varanus rosenbergi)*

Potential Threatened Species (Foraging) – Eastern Pygmy Possum (*Cercartetus nanus),* Little Eagle (*Hieraaetus morphnoides),* Glossy Black-Cockatoo (*Calyptorhynchus lathami*), Gang-gang Cockatoo (*Callocephalon fimbriatum),* Little Lorikeet (*Glossopsitta pusilla*), Barking Owl (*Ninox connivens),* Powerful Owl (*Ninox strenua*), Masked Owl (*Tyto novaehollandiae*), Varied Sitella (*Daphoenositta chrysoptera),* Scarlet Robin (*Petroica boodang),* Grey-headed Flying-fox (*Pteropus poliocephalus),* Yellow-bellied Sheathtail-bat (*Saccolaimus flaviventris),* Eastern Bentwing-bat (*Miniopterus orianae oceansis),* Little Bentwing-bat (*Miniopterus australis),* East-coast Freetail-bat (*Micronomus norfolkensis*)

Threatened Species Habitat – Breeding habitat (Red-crowned Toadlet), Critical Habitat (Rosenberg's Goanna)

OBJECTIVES

- to manage the landscape for the ongoing sustainability of insitu ecological resources
- to retain important natural and cultural features within and adjoining the area.

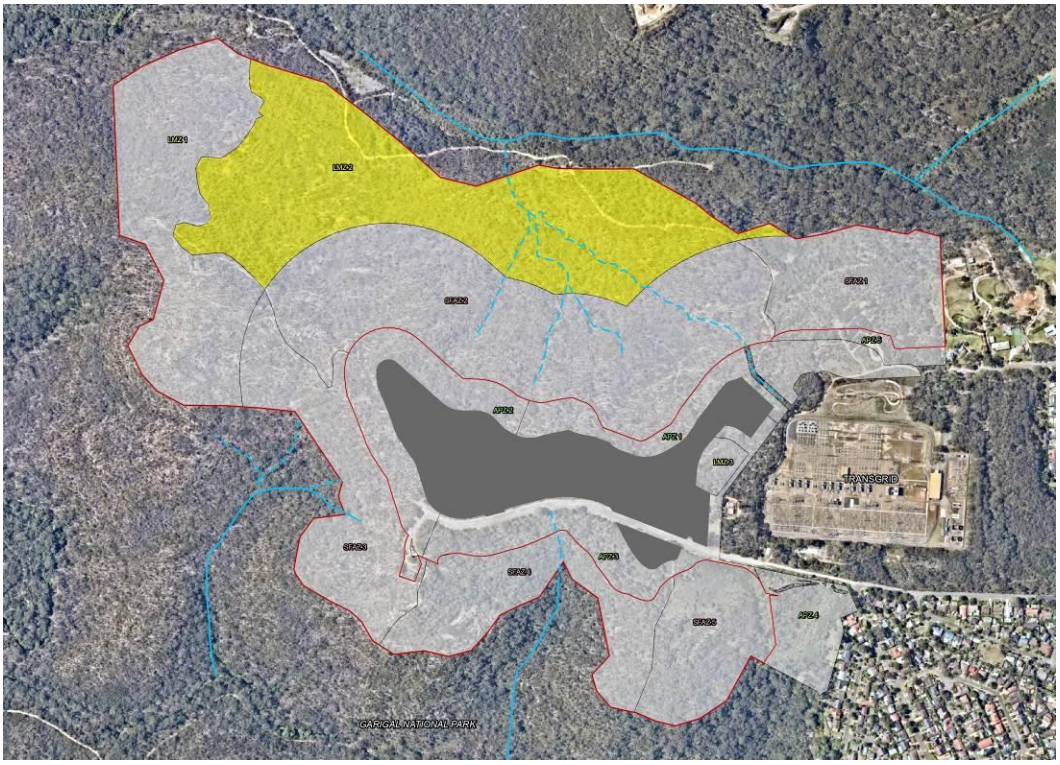
STRATEGIES

- to manage the environment in general accord with Table 10
- do not burn beyond the natural burn regime
- manage fire trails in accord with contemporary standards.

ACTIONS

- undertake prescribed burns as per Table 4a
- monitor wildfire impacts and map and record all data.

Land Management Zone 2 - (LMZ 2)



BACKGROUND

Area = 21.44 ha

Vegetation community	Vegetation Formation	Area (ha)
Low Open Forest (to 10m tall)	Dry Sclerophyll Forest	10.98
Open Forest (10+m tall)		4.98
Sandstone Gully Forest		2.31
Tall Heath (2.5 - 5m tall)	Heathland	2.75
Cleared, Managed, Landscaped or Weed Plume	N/A	0.42

Threatened Species – Giant Burrowing Frog (*Heleioporus australiacus*), Red-crowned Toadlet (*Pseudophryne australis),* Glossy Black-Cockatoo (*Calyptorhynchus lathami),* Rosenberg's Goanna (*Varanus rosenbergi)*

Potential Threatened Species (Foraging) – Eastern Pygmy Possum (*Cercartetus nanus),* Little Eagle (*Hieraaetus morphnoides),* Gang-gang Cockatoo (*Callocephalon fimbriatum),* Little Lorikeet (*Glossopsitta pusilla*), Barking Owl (*Ninox connivens),* Powerful Owl (*Ninox strenua*), Masked Owl (*Tyto novaehollandiae*), Varied Sitella (*Daphoenositta chrysoptera),* Scarlet Robin (*Petroica boodang),* Grey-headed Flying-fox (*Pteropus poliocephalus),* Yellow-bellied Sheathtail-bat (*Saccolaimus flaviventris),* Eastern Bentwing-bat (*Miniopterus orianae oceansis),* Little Bentwing-bat (*Miniopterus australis),* East-coast Freetail-bat (*Micronomus norfolkensis*)

Threatened Species Habitat – Breeding habitat (Red-crowned Toadlet), Breeding habitat (Giant Burrowing Frog), Critical Habitat (Rosenberg's Goanna)

OBJECTIVES

- to manage the landscape for the ongoing sustainability of insitu ecological resources
- to retain important natural and cultural features within and adjoining the area.

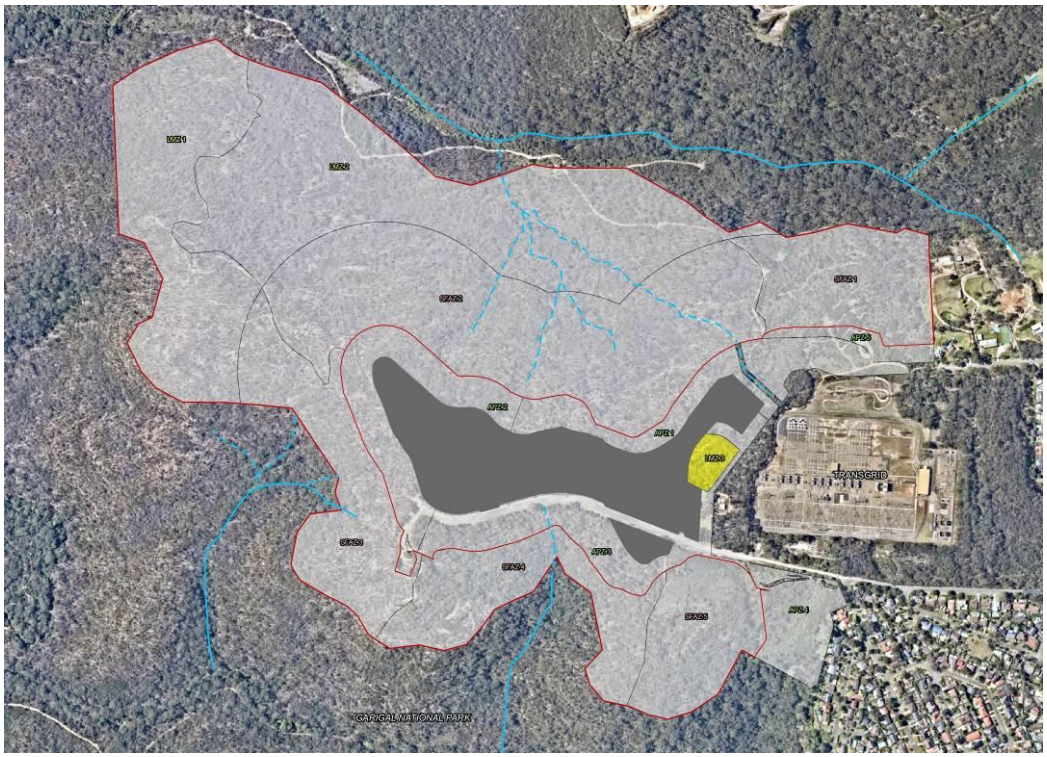
STRATEGIES

- to manage the environment in general accord with Table 10
- do not burn beyond the natural burn regime
- manage fire trails in accord with contemporary standards
- avoid identified threatened frog breeding locations

ACTIONS

- undertake prescribed burns as per Table 4a
- monitor wildfire impacts and map and record all data.

Land Management Zone 3 - (LMZ 3)



BACKGROUND

Area = 0.70 ha

Vegetation community	Vegetation Formation	Area (ha)
Open Forest (10+m tall)	Dry Sclerophyll Forest	0.67
Cleared, Managed, Landscaped or Weed Plume	N/A	0.03

Threatened Species –Rosenberg's Goanna (*Varanus rosenbergi)*

Potential Threatened Species (Foraging) – Little Lorikeet (*Glossopsitta pusilla*), Glossy Black-Cockatoo (*Calyptorhynchus lathami*), Grey-headed Flying-fox (*Pteropus poliocephalus),* Eastern Bentwing-bat (*Miniopterus orianae oceansis),* Little Bentwing-bat (*Miniopterus australis),* New Holland Mouse *(Pseudomys novaehollandiae)*

Threatened Species Habitat – Critical Habitat / termite mound (Rosenberg's Goanna)

OBJECTIVES

- to manage the landscape for the ongoing sustainability of insitu ecological resources
- to retain important natural and cultural features within and adjoining the area.

STRATEGIES

- to manage the environment in general accord with Table 10
- avoid identified threatened frog breeding locations

ACTIONS

- undertake prescribed burns as per Table 4a
- monitor wildfire impacts and map and record all data.

Plan administration 6

6.1 Management of works

The works programmed for the next five years (2016-2021) will be implemented and maintained by *the Community Association.*

An annual report on all auditing of the required asset protection, prescription burning and / or other hazard management works will be completed, which will be submitted to;

- *Metropolitan Local Aboriginal Land Council*
- Warringah-Pittwater Bush Fire Management Committee, RFS Headquarters.
- Warringah-Pittwater RFS

The audit report will comprise fire reporting forms as attached in Annexure 4 inclusive of a summary of any or all fires that have occurred on site or on the immediate border of the site (private lands, national park lands); and all hazard management works undertaken in the period and all advice in respect of all and any matters that require attention for the protection of life property and the environment. This will also assist in ecological planning on border management issues.

6.2 Environmental assessment of scheduled works

An environmental assessment shall be prepared for the activities listed in the proposed annual works schedules. The assessment will be forwarded to the Warringah-Pittwater RFS for determination in accordance with the requirements of the *RF Act* six (6) months prior to the intended date of the burn and or works. This time is necessary for the RFS to process the plan and prepare an operational burn plan should they be the organisation to implement any such burn.

Annexure 1 provides a list of matters that should be compiled in respect of implementation of this FMP 2012.

6.3 Approvals required to undertake fuel management works

This FMP, when approved, will be an approval under Part 4 of the *EP&A Act* via a development consent; and will thus be an approval for the implementation of hazard reduction works and all prescribed burns outlined in Tables 4a/4b for the life of this plan.

Any additional burn outside of the life of this plan will either require an additional DA consent and / or approval by the RFS in accordance with the RFS *Bushfire Environmental Assessment Code.* See RFS web site for reference to code and procurement of hazard reduction forms.

6.4 Monitoring fuel

Fuel sampling will be required to occur pre and post fuel reduction activities and recorded into a database for future reference. Periodic fuel sampling will be required as part of zone requirements to determine the need for hazard reduction burning. Fuel sampling will be carried out according to the fuel sampling guidelines attached in Annexure 3.

6.5 Monitoring fire regimes and changes to biodiversity

Mapping of all fires, both planned and unplanned, will be required to ensure that information is available for effective analysis of fire regimes and / or changes to biodiversity.

A Fire Reporting Form is attached as Annexure 5.

6.6 Operations works schedule

The operational works schedule specifies the proposed activities in prescribed burning for strategic management, asset protection and heritage management.

The Operational Works Schedule for 2012–2021 is attached at Annexure 1.

The ability to implement each planned burn or other prescribed activity will be influenced by seasonal conditions, resources and fire events.

6.7 Asset protection zones

Fuel reduction will need to be carried out by *Metropolitan Local Aboriginal Land Council* in accordance with recommendations outlined in the operational works schedule.

Such works will occur in the following areas:

- APZs
- SFAZs
- LMZs

6.8 Fire management access

Trail maintenance will be undertaken by the *Metropolitan Local Aboriginal Land Council*

Training will be required to initiate work concepts and standards of care and or construction. The suggested schedule for maintenance of these tracks is attached in Annexure 1.

6.9 Plan review

There may be a need to review fire management strategies as further information and research into the management of flora and fauna develops.

To ensure that regular reviews are undertaken, this fire plan has an operational life span of 5 years until the year 2021. At the completion of this time period, the plan will be formally reviewed via a similar process as outlined above.

Given the expected development programme for the planning proposal, this plan should be reviewed annually during the development stages of the project.

6.9.1 Evaluation

There are a number of ways to evaluate the effectiveness of this plan. The monitoring of the issues outlined below will determine the level of success from the implementation of this plan. It will also prove how effective the actions recommended by this plan have reduced the impact of adverse fire events and management.

The issues which will govern this plan's success are through the:

- protection of life and property from the adverse effects of fire
- maintenance of reduced hazardous fuel levels in strategic locations associated with the residential settlements
- the demonstrated ongoing and effective management of the E3 APZ
- the retention of insitu habitat elements and wildlife utilisation within the E3 APZ
- maintenance of biodiversity through the appropriate management of fire regimes
- management of existing fire trails
- communication of management decisions in respect of the FMP 2015-21 and its implementation program.

6.9.2 Life and property protection

The achievement of these objectives will be evaluated by the:

- co-operation with the Warringah-Pittwater Bush Fire Management Committee through the provision of public education on fire prevention, preparedness and response for residents of the general Belrose area.
- collection and maintenance of accurate fire history records and an evaluation of trends
- upgrading and maintenance of the tracks to the identified standard.
- the implementation of the Schedule of Works which can be implemented readily.

6.9.3 Maintenance of biodiversity

The achievement of these objectives will be evaluated by:

- comparing fire history with the fire regimes identified within each zone to determine the adherence to the prescription
- the incidence of fire in the fire sensitive vegetation and or locations
- the recovery of other recently burned vegetation communities
- the success of neighbourhood relations and in particular the incidence of arson activities of accidental fire ignitions
- accurate recording of all planned and wildfires
- no loss of threatened species, populations or endangered ecological communities.

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Annexures

ANNEXURE 1

OPERATIONAL WORKS SCHEDULE 2017-2023

The schedule of works includes operations on:

- Works 1 - Environmental assessment procedure
- Works 2 - Fire trail works
- Works 3 - Asset management works
- Works 4 - Burning programs
- Works 5 - Work timetable
- Works 6 - Monitoring requirements
- Works 7 - Operational guidelines

Details are provided below.

WORKS 1 - Environmental Assessment of Scheduled Works

This FMP, when approved at DA stage, will be an approved under Part 4 of the *EP&A Act* via a development consent; and will thus be an approval for the implementation of hazard reduction works and all prescribed burns outlined in Table 4a (as amended).

Any burns undertaken within the life of this plan will require compliance with the RFS *Bushfire Environmental Assessment Code.* See RFS web site for reference to code and procurement of hazard reduction forms.

To ensure contiguity, this FMP should be approved every 5 years.

WORKS 2 - Trail Maintenance Works

The works will be undertaken in accordance with the design specifications required by the Warringah / Pittwater bushfire management committee. Initial works funding will be part of the development expenditure.

Note: Ongoing funding opportunities are also available from the NSW Bushfire Council Co-ordinating Committee for trail maintenance. This is managed by the Warringah - Pittwater Bushfire Management Committee.

WORKS 3 - Asset Management Works

The following information relates to the fuel management zones identified on Figure 7 attached and should be read in conjunction with that figure.

The proposed R2 land will be managed by the owners of the individual allotments and these lands will not be subject to an integrated fuel management regime as for the E3 lands.

The implementation of the APZs will require modification of 12.79ha of the E3 land. Attention has been given to the varying landscape character and the need to provide habitat function through the retention of various landscape elements such as trees, shrubs, sandstone outcrops etc.' – refer to Table 3 and Figure 6.

In addition, a prescribed burning program is proposed in land entitled the Strategic Fire Advantage Zones (SFAZ) and Land Management Zones (LMZ) are to be undertaken by the community association in consultation with surrounding landholders (MALC & National Parks).

Ongoing management of the APZ is likely to be in the vicinity of $120,000 after purchase of required machinery. Machinery would include;

- 1 x (4x4) tractor (>75hp) slasher combination with tritter attachment
- 1 x out front mower e.g. Iseki 33 (30hp)
- 4 x brush cutters
- Misc. hand tools.

It is envisaged that some APZ works will occur by the development contractors at project-start up whilst more sensitive works would be undertaken by the land owner (*Community Association*). For example, roadway and in-lot setback (5.18ha) would be undertaken by contractors whilst E3 lands APZ (10.15ha) would be undertaken by land management contractors. The E3 lands comprise 70% of the APZ.

Important note:

Upon initiation of the APZ within the E3 lands, a detailed mapping exercise should be undertaken to define the exact management treatments across the five (5) APZs zones. This will be the basis of the future works sheets for the APZ zones and the auditing protocols. The mapping will have a plan for each APZ indicative of the ecological features provided in Table 3 and depicted on Figure 6.

WORKS 4a - Under-scrubbing and other physical Works Program 2017-2022

(This table to be completed prior to the submission of the Development Application)

Formal under-scrubbing or other fuel removal works will be required within the APZ management zones identified in the table below in the years specified. However the initial treatment/s will be a specialist work activity and will require the authors of this FMP to supervise all works in the APZ to achieve compliance with the ecological elements raised in Table 3 and Figure 6. No works are required in the SFAZ and or LMZ in the foreseeable future.

Table 4a - Proposed under-scrubbing works

Zone	2017	2018	20019	2020	2021	2022
APZ 1	Yes	Yes	Yes	Yes	Yes	Yes
APZ 2	Yes	Yes	Yes	Yes	Yes	Yes
APZ 3	Yes	Yes	Yes	Yes	Yes	Yes
SFMZ 1	Nil	Nil	Nil	Nil	Nil	Nil
SFMZ 2	Nil	Nil	Nil	Nil	Nil	Nil
SFMZ 3	Nil	Nil	Nil	Nil	Nil	Nil
SFMZ 4	Nil	Nil	Nil	Nil	Nil	Nil
SFMZ 5	Nil	Nil	Nil	Nil	Nil	Nil
LMZ 1	Nil	Nil	Nil	Nil	Nil	Nil
LMZ 2	Nil	Nil	Nil	Nil	Nil	Nil
LMZ 3	Nil	Nil	Nil	Nil	Nil	Nil

- Yes denotes works is required
- Nil denotes no work is required.

WORKS 4b - Prescribed Burning Program 2017-2022

(This table to be completed prior to the submission of the Development Application)

Table 4b - Proposed prescribed burning works

Zone	2017	2018	2019	2020	2021	2022
APZ 1	Nil	Nil	Nil	Nil	Nil	Nil
APZ 2	Nil	Nil	Nil	Nil	Nil	Nil
APZ 3	Nil	Nil	Nil	Nil	Nil	Nil
SFMZ 1	Nil	-	-	-	-	-
SFMZ 2	Nil	-	-	-	-	-
SFMZ 3	Nil	-	-	-	-	-
SFMZ 4	Nil	-	-	-	-	-
SFMZ 5	Nil	-	-	-	-	-
LMZ 1	Nil	-	-	-	-	-
LMZ 2	Nil	-	-	-	-	-
LMZ 3	Nil	-	-	-	-	-

- green shading refers to these zones being planned for prescribed burns in 2016 IF such burns are within regime
- Y denotes works is required
- nil denotes no work is required.

WORKS 5 - Works timetable

The works identified in Tables 4a & 4b above will be implemented following environmental assessment and / or Council approval protocol being achieved.

A photographic essay should be used to provide historical evidence of works and or standards required.

Zone type	Period of works	Responsibility
Asset (APZ) within E3 lands (10.15ha) and an additional 2.34ha internal to the E3 lands	Ongoing. Day to day works with the program intensifying between July-February.	*The community association*
Strategic (SFMZ)	As per fire regime prescriptions identified for each vegetation community / or as specified if required by the RFS.	*The community association*
Land Management Zone (LMZ)	As per fire regime prescriptions identified for each vegetation community.	*The community association*

WORKS 6 - Monitoring strategies

The following strategies are required to be implemented:

1. The measures / strategies outlined in the bushfire protection assessment (2017) submitted with the Planning Proposal (as amended) are implemented.

2. The development works should be undertaken in accordance with the approvals required by Warringah Council.

3. Ongoing and regular dialogue with *Rural Fire Service*, *OEH* and *Warringah Council* should occur in respect of development control matters and their relevance to bushfire protection of the site and nearby adjacent areas.

4. Hazard (fuel) management works will be undertaken in accordance with the objectives of this FMP.

5. Ongoing consultation will occur with neighbours in respect of hazard management and adjacent off site protection measures.

6. The hazard management program will be implemented in line with guidelines of this plan.

7. Bushfire suppression infrastructure is provided in line with the development agreement with Council and agreements with the *RFS*.

8. Post burn mapping and monitoring will be undertaken by fire ecologists to determine if the objectives of the prescribed burn have been achieved.

9. Post burn monitoring of weed infestation will occur with a follow up plan to remove such infestations.

10. Adequate access is provided to allow effective suppression of non-planned wildfire.

11. Hazard (fuel) management works are implemented in accordance with the ecological objectives.

12. A review of the monitoring program should be undertaken as part of the annual review of the FMP post 2017 or whenever the program begins.

13. Upon initiation of the APZ within the E3 lands a detailed mapping exercise should be undertaken to define the exact management treatments across the five (5) APZ zones. This will be the basis of the future works sheets for the APZ zones and the auditing protocols. The mapping will have a plan for each APZ indicative of the ecological features provided in Table 3 and depicted on Figure 6.

14. To ensure that regular reviews are undertaken, this fire plan has an operational life span of 5 years. At the completion of this time period, the plan will be formally reviewed via a similar process as outlined above.

15. Given the expected residential development programme for the development project will be over 2-3 years, this plan should be reviewed six monthly during the development stages of the project and annually after project establishment. Of particular note will be the need to monitor lands that have been sold by the developer and have / have not been built upon and therefore may cause an interim hazard for neighbouring allotments that have built houses. This can be a major impediment to hazard management and the management of those hazards must be dealt with quickly.

WORKS 7 - Operational guidelines

Works are guided by the objectives strategies and actions identified within the management zones in Section 5.

7.1 Fuel management within the asset protection zones

Fuel management within the APZs should be maintained by regular maintenance of the landscaped areas / mowing of lawns in accordance with the publications of the RFS and specifically as per the zone management guidelines in Section 5. Notwithstanding the specialist advice in those guidelines, the following general advice for maintaining an APZ should be followed:

- mowing of grass - grass needs to be kept short and, where possible, green.

- raking or manual removal of fine fuels - ground fuels such as fallen leaves, twigs (less than 6mm in diameter) and bark should be removed on a regular basis. This is fuel that burns quickly and increases the intensity of a fire. Fine fuels can be removed by hand or with tools such as rakes, hoes and shovels.

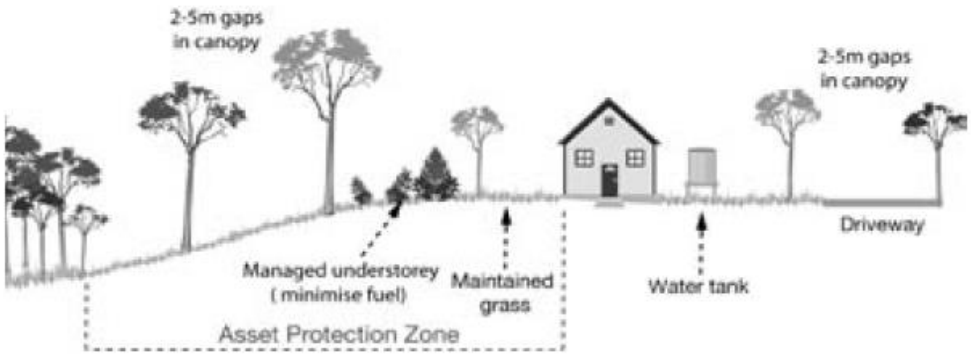
- in some cases raked up fuels can be piled and burnt insitu. The piles can be burnt in accord with guidelines in Appendix 2 of this FMP.

- removal or pruning of trees, shrubs and understorey - the control of existing vegetation involves both selective fuel reduction (removal, thinning and pruning) and the retention of vegetation. Prune or remove trees so that you do not have a continuous tree canopy leading from the hazard to the asset. Separate tree crowns by 2-5m. A canopy should not overhang within 2-5m of a dwelling. Native trees and shrubs should be retained as clumps or islands and should maintain a covering of no more than 20% of the area.

In addition, the following general APZ planning advice should be followed.

- ensure that vegetation does not provide a continuous path to the house
- plant or clear vegetation into clumps rather than continuous rows
- prune low branches 2m from the ground to prevent a ground fire from spreading into trees
- locate vegetation far enough away from the asset so that plants will not ignite the asset by direct flame contact or radiant heat emission

- ensure that shrubs and other plants do not directly abut the dwelling. where this does occur, gardens should contain low-flammability plants and non-flammable ground cover such as pebbles and crush tile
- the following RFS diagram depicts one version of an ideal situation.



7.2 Fire regime strategies for biodiversity conservation

Prescribed burning should take into consideration the following points:

- exclude fire from zones containing threatened flora species unless specified in this FMP; and where the fire regime has been appropriately considered
- where possible initiate burning regimes that allow fire thresholds to be maintained for each vegetation community and / or species
- encourage and assist where possible fuel mitigation in cooperation with neighbours
- where appropriate, carry out mitigation requirements which do not involve burning
- monitor weed occurrences within riparian and peripheral zones after fire events.

7.3 Use of prescribed burning practices

Prescribed burning should take into consideration the following points to afford protection to the physical environment.

- a burn plan will be prepared for each prescribed burn with a clear set of objectives, taking into account fuel management and biodiversity requirements including the required fire behaviour
- sensitive environmental values and protective strategies should be identified
- ignition pattern will be determined by likely forward rate of spread (FROS) and wind direction, allow for slope, use test fires
- hazards likely to affect fire behaviour or reduce ability to maintain control must be identified during the planning process and their impact minimised
- low intensity prescribed burns are best carried out when fine fuel moisture contents (FMC) are in a range 13-16% oven dry weight (ODW), field tests can support this information, (a burning prescription should describe maximum and minimum values for FMCs, weather and fire behaviour)
- potential escapes and control strategies identified

- post burn mapping and monitoring will be undertaken to determine if the objectives of the prescribed burn have been achieved
- post burn monitoring of weed infestation will occur with a follow up plan to remove such infestations.

7.4 Use of machinery

When using steel tracked or rubber tracked / tyred earth moving machinery, the following basic operational guidelines should be adhered to:

- slashers and other similar machinery are operational capable on slopes less than 15 degrees
- ensure that slashers and other machinery do not bring exotic plant material onto E3 lands, pre-washing of undercarriages, etc. should occur
- restrict heavy machinery use to existing trail or control line routes
- ensure machinery is not used during or following wet weather events
- close and rehabilitate all new tracks constructed for emergency operations immediately after any fire incidents
- incorporate remedial works for erosion control and weed infestation.

7.5 Cooperation with neighbours

Fuel management will require cooperation with neighbours e.g. the private allotment, OEH (NPWS) and the energy company.

Section 63 of the *RF Act* requires land owners and / or occupiers of land to take all practical steps to stop the spread of fire.

The *Warringah-Pittwater Bush Fire Management Committee* works to create co-operation and co-ordination between land management agencies, land owners and fire fighting agencies

7.6 Smoke management

There is an increasing need to take account of smoke dispersal and its impact upon members of our community. Smoke from bushfires and from prescribed fires can cause human health and environmental issues. Sufferers of asthma and other similar conditions are severely stressed during a smoke event and their health is a major issue to any land manager undertaking prescribed burn operations.

Prescribed burning generates smoke, which periodically affects the atmosphere in the region during autumn and early winter. Smoke is also generated by prescribed burning operations on other land tenures, such as private property.

Smoke is a consideration when burning close to roads, settlements or tourist areas. Frequently, favourable prescribed burning conditions coincide with holiday periods.

Prescribed burning will be conducted, considering the above concerns. Weather conditions will be monitored and, where practicable, consistent with the overall aims of the burning operation, lighting patterns will reflect the need to minimise smoke drift. Specific traffic control measures will be put in place where there is any likelihood of road hazard due to smoke and residents will be given adequate notice.

7.7 Monitoring of fuel management activities

The monitoring of fire protection measures is important to the eventual success of any works program. In particular, monitoring can be used to determine the effectiveness of fire protection measures and allow for the establishment of appropriate fire suppression infrastructure and services.

Maintaining and monitoring fuel management will be a major key to the success of any strategies that are implemented. The initial stages of fuel management are important, however, fuel management needs to be ongoing with evolving strategies that suit the growth of the development.

Management decisions therefore need to be monitored. This will ensure that those in charge are being responsible land managers, but also, so the authorities have a picture of the intended standard and consistency of fuel management.

Thus *Community Association* will need to ensure that performance assessment criteria are established during the initial implementation phase of the fuel management program.

ANNEXURE 2

OPTIONS for FUEL MANAGEMENT TREATMENTS

Mowing, Slashing and Under scrubbing

Description:

The use of mechanical scrub mulchers, slashers or brush cutters is used to reduce the mass of understorey which reduces the height and increases the compaction of the understorey. The debris resulting from cutting the understorey may either be mulched on site or removed. While some smaller trees may be removed, larger over-storey trees are not disturbed.

How It Works:

By reducing understorey height and increasing compaction, rate of combustion and therefore fire behaviour is reduced (aerial fuels can have up to five times the effect on fire behaviour as the same amount of fuel on the ground). This enables bushfires to be suppressed under a wider range of weather conditions than would otherwise be possible.
Under scrubbing also increases the rate of fuel decomposition which reduces fuel loads and subsequent fire behaviour.
Creates a vertical fuel discontinuity which makes it more difficult for fires to climb from surface and near surface fuels into tree canopies (i.e. become a crown fire).

Effectiveness:

Because under scrubbing does not remove all fuel, bushfires can still cross treat areas by burning across them, by direct flame contact or by spotting. Crown fires can still develop within areas that have been under scrubbed. Under scrubbing simply reduces fire behaviour in the treated area so that fires can be controlled under a wider range of weather conditions.
The effectiveness of under scrubbing largely depends on the height to which the understorey was cut, the height of the surrounding untreated understorey, the width of the treated area, the time since under scrubbing was conducted, the environmental conditions since under scrubbing was conducted and the fuel load remaining in the treated area.
The understorey often regenerates once it has been cut and hence frequent maintenance is usually required to maintain an adequate level of protection.
As well as reducing fire behaviour, under scrubbing may also increase vehicular access which makes it possible to suppress higher intensity fires.

Limitations:

Does not prevent bushfires or ensure all bushfires can be controlled or contained.
Use is limited to areas with good access. Cannot be used in areas which have steep slopes, rocky ground or a high density of trees (unless done by brush cutter).
Is of limited benefit in forests due to the very large width that needs to be slashed to have a significant effect on subsequent fire behaviour.
Is only applicable to treating relatively small areas, particularly if slashing is to be done by brush cutters.
Sparks caused by slashers hitting rocks may start fires, particularly in grasslands, if slashing is conducted when fuels are dry.
Slashing when the vegetation is green and damp may actually increase fire behaviour in the short term because the cut vegetation will dry out and immediately become flammable. It is better to delay slashing until after the vegetation has begun drying out. Thus, timing is a critical issue with slashing.
Rocks dislodged by slashers become projectiles which may damage people and property.
Under scrubbing usually results in some soil disturbance which may provide opportunities for weed invasion and damage cultural heritage sites.

Application:

Management may prescribe the use of under scrubbing in APZs to protect life and property or cultural sites.
Management may prescribe the use of under scrubbing in other fire management zones to strengthen other fire control advantages such as along tracks and trails.

Complete Fuel Removal

(Source: *NPWS* 2003)

Description: The complete removal of all flammable material by slashing or similar.

How It Works: All flammable fuel is removed and hence subsequent bushfires cannot burn across the treated area.
Provide a control line that may be used for lighting back burns off.

Effectiveness: Effectiveness largely depends on the width of the treated area and the fuel characteristics adjacent to it. Effectiveness is significantly reduced by the presence of trees close to the treated area (because bushfires can climb the trees and spot across the treated area).
Very effective at containing low intensity bushfires with no spotting because the treated area is inflammable.
Very effective at containing grassfires because grassfires usually have a low flame height and produce only short distance spotting. Considerably less effective in forest because of the greater flame heights and spotting distances in forests.
Fuel removal increases vehicular access which makes it possible to suppress higher intensity fires.

Limitations: Bushfires may still cross treat areas by direct flame contact or by spotting across them. Use is limited to areas with reasonably good access. Cannot be used in areas where steep slopes or rocky ground prevents the use of ploughs, graders or bulldozers.
Results in soil disturbance which may provide opportunities for weed invasion and erosion and damage cultural heritage sites.
Areas treated with fuel removal techniques require regular maintenance to keep them in a fuel free state.
If herbicides are used, may kill surrounding, non-target, vegetation species.

Application: Complete fuel removal techniques may only be used in small areas within APZs to protect life and property or cultural sites.

Prescribed Burning

(Source: NPWS 2003)

Description: The planned application of fire, either by ground or from the air, under prescribed weather conditions and within defined boundaries to modify fuel characteristics including fuel load, continuity and arrangement.

How It Works: By modifying fuel characteristics, including fuel load, continuity and arrangement, bushfire rate of spread, flame height, intensity and spotting distance is reduced. This enables bushfires to be suppressed under a wider range of weather conditions than would otherwise be possible.

Effectiveness: The effectiveness of a prescribed burn depends on how successful the burn was in the first place, the time since the burn, the environmental conditions since the burn was conducted and the vegetation type in which the burn was conducted.
The effect of prescribed burning on subsequent fire behaviour lasts longer in forest and woodland (typically 2-7 yrs) than heathland (typically 2-4 years) and grassland (typically <1–2 years).
Prescribed burning is the only practical means of modifying fuels over large areas.

Limitations: Does not prevent bushfires or ensure all bushfires can be controlled or contained.
Can only be conducted under a narrow range of weather conditions.
Has only a very short-term effect on subsequent fire behaviour in some vegetation types, particularly grasslands and heath.
In some vegetation types may actually increase fire behaviour in the longer term by encouraging the replacement of moist understorey species, which are rarely dry enough to burn, with drier and more flammable understorey species. This particularly applies to damper vegetation types including wet sclerophyll forest and rainforest.
The frequency of burning required to maintain a high level of protection often exceeds biodiversity fire regime thresholds.
Disturbance caused by prescribed burning may provide opportunities for weed invasion and erosion.
Smoke produced by prescribed burns may pollute the air and present a traffic hazard.
There is a chance of prescribed burns escaping the planned boundaries of the burn and damaging natural, cultural or capital assets.

Application: Management may stipulate the use of prescribed burning in any fire management zone.
Management will normally only prescribe the use of high frequency prescribed burning in small areas within APZs to protect life and property or cultural heritage sites.
Management may stipulate the use of prescribed burning over broader areas but at a lower frequency in strategic fire advantage zones to strengthen existing fire control advantages or to reduce the intensity and spotting distance of subsequent bushfires to assist in their control.
As well as being used to manage fuels, The Association may stipulate the use of prescribed burning over broad areas within heritage management zones to maintain fire regimes within biodiversity fire regime thresholds.

Pile Burning

Description: The planned application of pile burning under appropriate weather conditions and within defined boundaries to reduce fuel load.

How It Works: By reducing fuel load the bushfire rate of spread, flame height, intensity and spotting distance is reduced. This enables bushfires to be suppressed under a wider range of weather conditions than would otherwise be possible.

Effectiveness: Pile burning is effective to reduce fuel load without the need to take excess fuels of site.

Limitations: Does not prevent bushfires or ensure all bushfires can be controlled or contained.

Can only be conducted under a narrow range of weather conditions.

Smoke produced by pile burns could possibly, but unlikely, pollute the air and present a traffic hazard and or a health hazard to neighbours with respiratory issues.

There is a chance of pile burns escaping the planned boundaries of the burn and damaging natural, cultural or capital assets

Must be undertaken by skilled persons.

Application: Management may prescribe the use of pile burning in an APZ in an effort to reduce fuel loads.

ANNEXURE 3
FUEL SAMPLING GUIDELINES

These guidelines have been compiled from practical experience of the author John Travers, the National Parks and Wildlife Service, the CSIRO Bush Fire Behaviour Unit, Department of Forestry and State Forests.

Fuel sampling is required where fuel weights need to be determined to establish an acceptable level of hazard. The more fuel, the more hazard. Samples should be taken from a range of locations that vary in slope, aspect, canopy cover, tree height, tree and understorey density and in particular, vegetation type. The samples should therefore be representative of the insitu landscape inclusive of the vegetation characteristics of an area. The data sampled will have a useful application for determining potential bushfire behaviour and possible fuel management techniques within that portion of the site. In any area where fuel samples are to be gathered, they should be collected at random but with a proviso that various densities or type of vegetation should ideally be gathered. Following this the sample weights should be averaged. Fuel measurement samples should be taken from at least ten (10) separate locations (per hectare) and such sample materials will need to be dry to touch. A sample plot shall need to include all material within a 0.5 metre long by 0.5 metre wide square.

At each sample location the square should be thrown and wherever it lands, that is where the sample should be taken. Then;

1. Level the square firmly on the ground and cut all around the inside edge with a sharp knife or scissors.
2. Discard all the fuel outside the square that has been severed.
3. Collect all the fuel within the square up to one metre above the ground including all litter, grasses, ferns, bracken, leaves or needles, bark, twigs and branches whether living or dead.
4. Discard any fuel in excess of 6 mm diameter which is approximately pencil thickness.
5. All remaining fuel should then be carefully placed in a strong plastic bag, labelled with dates, location and sample number.
6. Dry the fuels in the hot sun (over 35 degrees) for 3 sessions of 7-8 hours by laying on hot concrete (bring in overnight to avoid due); or place in an oven for 3 hours on lowest heat setting or place in a vertical type clothes drier for 3 hours.

Assessment of fuel loading should be carried out by a competent person according to these guidelines.

Equipment Required – Steel or plastic square (500mm x 500mm), spring weight scale, plastic bags, conversion chart, knife or scissors, notebook and pencil.

Example Assessment – Fuel weight is calculated usually in grams. Sample size is typically either using square of varying sizes e.g.

1. 250mm x 250mm, or
2. 500mm x 500 mm, or
3. 1000mm x 1000mm

Multiply **average sample weight** by the appropriate multiplication factor as shown in the following table. It is imperative that the correct multiplying actor be used and that only the average sample is multiplied.

Table of multiplying factors for varying sample size quadrats to achieve *tonnes per hectare*

Sample size	Multiplying factor
0.25 x 0.25 m (0.0625 m^2)	0.16
0.5 x 0.5 m (0.25 m^2)	4.0
1.0 x 1.0 m (1.0 m^2)	1.0

Example Calculation - Total fuel weight of one (0.25m x 0.25m) sample = 85 grams. Multiply 85 grams X 160,000 to arrive at grams per hectare sample size. e.g.

85 grams x 160,000 = 136,000,000 grams per hectare
Divide by 1,000,000 to convert to tonnes

i.e.

136,000,000 grams divided by 1,000,000 = 13.60 tonnes per hectare
Or more simply by multiplying the fuel weight of 85 grams by 0.16

Calculation of shrub fuel loads such as a *Banksia ericifolia* or Tea tree shrub

If a dense shrub layer is present with no eucalyptus trees the following table provides an indicative fuel weight assessment. This table is vegetation community dependent and should be used as a guide only.

Source: *Forestry Commission*

Shrub cover	Add to ground fuel measurement
10-30%	2.5 tonnes / ha
35-50%	5.0 tonnes / ha
55-75%	7.5 tonnes / ha
over 75%	10.0 tonnes / ha

ANNEXURE 4

FIRE REPORTING FORM

(This form should be used by staff of *MLALC)*

The fire report presents a series of questions that must be answered.
Example answers are provided in italics.

Fire Number 1/2004 **Fire name** *Warrah Trig fire 2004*

Date Fire Started 18th Feb 2004 **Area Burnt** 3.56 ha

Expenditure $2560

Cause *Lighting of fire using accelerant.*

Source *Advice by RFS*

Motivation (Accident, negligence or arson) *Arson*

Duration of Fire *4.5 hours*

Fire Danger Rating *Very High*

Co-ordinates ***……***

Location *Wallarah Trig*

Tenure – Point of Origin *Private*

Detection

Reported by

Performance Assessment

- **Detection** *within 20 minutes*
- **Response** *RFS 10 minutes*
- **Strategy** *Direct attack*
- **Equipment** *Cat 1 tanker*
- **Manpower** *4 personnel*
- **Organisational** *RFS*
- **Other Organisations** nil
- **Damage** *Bushland*
- **Weather/Environment** *Hot N/W winds 30 kph winds 45% Relative Humidity*
- **Map** *1:25,000 topo'*

- **Comments:**

Items which may have been significant and may be worthy of comment include.

- *general fuel weights, vegetation type, curing, days since rain*
- *general weather, cloud, visibility, inversions, thunderstorms*
- *rates of spread, flame height, scorch height, spotting*
- *detection circumstances, co-operation or lack of, accuracy of location*
- *cause, legality, action taken*
- *fire control, strategy, management, unusual suppression measures, evaluation of these*
- *equipment, evaluation, problems, successes*
- *damage severity, losses., damage to capital improvements*
- *fire administration, special appointments, co-operation and conflicts*
- *involvement of licensees, lessees, neighbours, others*
- *effect on erosion, catchments, wildlife, recreation*
- *any significant items not sufficiently covered elsewhere.*

ANNEXURE 5

VEGETATION COMMUNITIES

Vegetation Community A – Short Heath

Occurrence – In relation to the proposed development area, this community occurs near to the centre of the site to the north of Ralston Avenue. The Low Heath vegetation is most similar to Sydney Coastal Heath as mapped by Smith and Smith (2000).

***Photo 1** – Low Heath vegetation approximately 200m west of the existing dwelling*

Structure – Low heath vegetation consisting of many *Fabaceae* plants generally to a height of up to 2.5m, with very occasional emergents. There is a dominance of shrub species and herbaceous groundcovers that are generally very dense. The species diversity within this community is generally lower than the Forest communities.

Disturbances – This vegetation community is impacted by walking / driving tracks.

Common species

Angophora hispida (Dwarf Apple), *Grevillea speciosa* (Red Spider Flower), *Banksia ericifolia* var. *ericifolia* (Heath-leaved Banksia), *Hemigenia purpurea* (Narrow-leaved Hemigenia), *Actinotus minor* (Lesser Flannel Flower), *Hakea teretifolia* (Dagger Hakea), *Phyllota phylicoides* (Heath Phyllota), *Xanthorrhoea media* subsp. *media* (Forest Grass Tree), *Persoonia lanceolata* (Lance-leaved Geebung), *Tetratheca ericifolia* (Black-eyed Susan), *Dillwynia floribunda* var. *floribunda* (Parrot Pea) and *Epacris pulchella* (NSW Coral Heath).

Vegetation Community B & B2 – Tall Heath and Damp Tall Heath

Occurrence – In relation to the proposed development area, this community occurs frequently to the south of Ralston Avenue, along the northern edge of Ralston Avenue, and within the north-west

portion of the flora study area. The Tall Heath and Damp Tall Heath vegetation is most similar to Sydney Coastal Heath as mapped by Smith and Smith *(*2000).

The Damp Tall Heath appears to have been artificially created by concentrated stormwater drainage from development areas upslope on adjoining lands, or is associated with an existing surface drainage line.

***Photo 2** – Tall Heath vegetation in Quadrat 5 (2008) looking east*

Structure – Tall heath vegetation consisting of a dominance of *Allocasuarina distyla* with several other heath species. Some emergent trees exist. The dominance by the *Allocasuarina distylla* limits the diversity of plant species within those surveyed quadrats. The average height of vegetation within this community is 2.5-5m.

Damp Tall Heath vegetation is typically a moderately dense scrub comprising of *Banksia ericifolia* with a combination of Hakea, Allocasuarina and Leptospermum species. South of Ralston Avenue, the vegetation community has been caused through disturbance and the structure varies more so with the presence of some tree ferns and weeds.

Disturbances – This vegetation community is impacted by walking / driving tracks.

Common species

Allocasuarina distyla (Scrub She-oak), *Leptospermum squarrosum, Darwinia fascicularis, Banksia ericifolia* var*. ericifolia* (Heath-leaved Banksia), *Hakea teretifolia* (Dagger Hakea), *Banksia spinulosa* var. *spinulosa* (Hairpin Banksia), *Actinotus minor* (Lesser Flannel Flower), *Lepyrodia scariosa* (Scale Rush) and *Leptocarpus tenax* (Slender Twine-rush).

Significance – Likely to provide some good quality habitat for the threatened or ROTAP species *Tetratheca glandulosa, Eucalyptus luehmanniana*, *Angophora crassifolia* and *Lomandra brevis.*

Vegetation Community C – Low Open Forest

Occurrence – This community is not considered threatened within the Warringah local government area (LGA) but *E. luehmanniana* is a rare species. Whilst the Low Open Forest is diverse with a mix of upper strata species, the area containing *E. luehmanniana* was prevalent within approximately 100m

north and south of Ralston Avenue. It was generally never found more than 100m north of Ralston Avenue. The extent of the *E. luehmanniana* to the south of Ralston Avenue was extensive and it crept downslope to the edges of the sandstone gully forest, although was less prevalent within the taller surrounding vegetation.

Photo 3 *– Low Open Forest within the central portion of the proposed development area*

Structure – Low Open Forest vegetation consists of a high proportion of heath species in the lower layers of vegetation with a low proportion of grass species. This community contains trees typically to a height of between 5-10m with a projected foliage cover (PFC) of 20-35%.

Disturbances – This vegetation community is impacted by walking / driving tracks.

Common species

Trees: *Corymbia gummifera* (Red Bloodwood), *Eucalyptus piperita* (Sydney Peppermint), *Eucalyptus haemastoma* (Scribbly Gum), *Eucalyptus luehmanniana* (Yellow top Ash), *Angophora hispida* (Dwarf Apple) and *Angophora crassifolia.*

Shrubs: *Allocasuarina distyla* (Scrub She-oak), *Banksia ericifolia* var*. ericifolia* (Heath-leaved Banksia), *Hakea teretifolia* (Dagger Hakea), *Banksia spinulosa* var. *spinulosa* (Hairpin Banksia), *Leptospermum polygalifolium* (Lemon Scented Tea-tree), *Gompholobium grandiflorum* (Golden Glory Pea), *Grevillea speciosa* (Red Spider Flower), *Grevillea buxifolia* (White Spider Flower), *Hakea sericea* (Needlebush), *Phyllota phylicoides* (Heath Phyllota) and *Platysace linearifolia* (Narrow-leafed Platysace).

Groundcovers: *Actinotus minor* (Lesser Flannel Flower), *Caustis flexuosa* (Curly Sedge), *Xanthorrhoea media* subsp. *media* (Forest Grass Tree), *Patersonia sericea* (Wild Iris), *Xanthosia tridentata* (Rock Xanthosia), *Lomandra glauca* subsp. *glauca*, *Pimelea linifolia* subsp. *linifolia* (Slender Rice Flower) and *Lomandra gracilis.*

Significance – Two (2) rare (ROTAP) species were quite common within this community, *Eucalyptus luehmanniana* and *Angophora crassifolia.* The threatened species *Tetratheca glandulosa* has also been observed.

Vegetation Community D – Open Forest

Occurrence – The community occurs immediately west and south of the Sydney East Substation and at the terminal end of Ralston Avenue. It was extensive further north within the study area. The Open Forest vegetation could be a combination of either Sydney Sandstone Ridgetop Woodland or Duffys Forest (an EEC) as mapped by Smith and Smith (2000). Assessment of the vegetation within all 2008 and 2011 quadrats found the vegetation not to be representative of Duffys Forest (in accordance with P & J Smith's Duffys Forest Index).

Photo 4 *– Open Forest vegetation along the northern edge of Ralston Avenue*

Structure – Open Forest structure but taller than the Low Open Forest, generally above 10m tall. This vegetation community contains a mixture of healthy understorey species with a moderate dominance of sclerophyllous species. Taller Eucalypt species dominate such as *Eucalyptus punctata* and *Eucalyptus sieberi.* This vegetation community comprises a partially grassy understorey unlike the low heath and tall heath vegetation communities.

Disturbances – This vegetation community is impacted by walking / driving tracks, a communications tower and an electricity substation.

Common species

Trees: *Eucalyptus punctata* (Grey Gum), *Corymbia gummifera* (Red Bloodwood), *Angophora costata* (Smooth-barked Apple), *Eucalyptus sieberi* (Silver-top Ash) and *Allocasuarina littoralis* (Black She-oak).

Shrubs: *Acacia terminalis* (Sunshine Wattle), *Melaleuca hypericifolia, Banksia ericifolia* var. *ericifolia* (Heath-leaved Banksia), *Platysace linearifolia* (Narrow-leafed Platysace), *Callistemon linearis* (Narrow-leaved Bottlebrush) and *Acacia longifolia* var. *longifolia* (Sydney Golden Wattle).

Groundcovers: *Entolasia marginata* (Bordered Panic), *Entolasia stricta* (Wiry Panic), *Tetratheca ericifolia* (Black-eyed Susan), *Pimelea linifolia* subsp. *linifolia* (Slender Rice Flower), *Lomandra longifolia* (Spiky-headed Mat-rush), *Lindsaea microphylla* (Lacy Wedge-fern) and *Lomandra gracilis.*

Significance – This vegetation community provides some habitat for the recorded threatened or ROTAP species *Tetratheca glandulosa, Eucalyptus luehmanniana* and *Angophora crassifolia.* Where vegetation within the canopy is dominated by *Eucalyptus sieberi* and *Corymbia gummifera,* this provides very good potential habitat for the threatened species *Grevillea caleyi,* particularly to the north and north east of the existing residence.